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IS 9085 (1979): Correction Slide for Mercury Barometers
[PGD 21: Meteorological Instruments]



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IS : 9085 - 1979

Indian Standard
SPECIFICATION FOR
CORRECTION SLIDE FOR
MERCURY BAROMETERS

UDC 551.508.2 : 681.2 088.3/.7 : 629.12.056.3



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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

July 1979

**AMENDMENT NO. 1 AUGUST 2002
TO
IS 9085 : 1979 SPECIFICATION FOR CORRECTION
SLIDE FOR MERCURY BAROMETERS**

Substitute 'hecta Pascal (hPa)' *for* 'millibar (mb)' wherever appears

(BP 21)

Reprography Unit, BIS New Delhi, India

Indian Standard

SPECIFICATION FOR CORRECTION SLIDE FOR MERCURY BAROMETERS

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Indian Standard
**SPECIFICATION FOR
CORRECTION SLIDE FOR
MERCURY BAROMETERS**

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 22 January 1979, after the draft finalized by the Meteorological Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 Atmospheric pressure is generally measured by means of either a mercury or an aneroid barometer. The Kew pattern or fixed cistern type mercury barometer is commonly used in the country for measurement of pressure due to the many advantages it has over the older conventional Fortin's type barometer. The requirements of this type of barometer are covered in IS : 5798-1970* while those of aneroid barometer are laid down in IS : 5793-1970†.

0.3 Specifications for fixed cistern barometers used both at land stations and on board ships have been prepared by the India Meteorological Department. The ship board marine barometers are used extensively on ships in addition to aneroid barometers. The marine mercury barometers normally carry a correction slide with thermometer instead of an attached thermometer in mount which is the standard accessory for a land based Kew type barometer. The slide greatly facilitates the reduction of the barometer readings for conditions of standard temperature, gravity and mean sea level.

0.4 While specifications for the correction slide, which is a precision instrument, have been prepared by the India Meteorological Department, no separate Indian Standard for these exists. The detailed specifications for the correction slide are also not included in IS : 5798-1970*. It is, therefore, felt necessary to bring out an Indian Standard dealing exclusively with the requirements for the correction slide generally attached to a ship board mercury barometer of the Kew type made to conform to the New Barometer Conventions.

0.5 In the formulation of this standard, due consideration has been given to the requirements laid down by the World Meteorological Organization, Geneva as well as the special circumstances obtaining in the country.

*Specification for mercury barometers.

†Specification for aneroid barometers.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements of the correction slide attached to a fixed cistern mercury barometer made to conform to the new barometer conventions for use on board ships. It includes the requirements of the thermometer which is an essential component of the slide.

2. DESCRIPTION

2.1 The correction slide (*see* Fig. 1) makes the use of tables unnecessary for the reduction and correction of barometer readings. It consists of a solid brass stock carrying a mercury-in-glass thermometer a movable slide whose position can be altered by means of a rack and pinion carrying scales of height above the water line and corrections to the barometer readings, and a movable plate carrying a scale of latitude which is set in a slot in the stock. Opposite the latitude scale, is a scale of index corrections. A temperature scale is also engraved and figured on the stock itself. A counter weight forming part of the slide is fixed to the rear of the barometer case at the same level as the rest of the slide; the counter weight is used to balance the weight of the stock and fittings in order that the verticality of the barometer may not be affected when the slide is fitted. Clips are provided at top and bottom for clamping the stock with the counter weight to the barometer case.

3. PATTERN

3.1 The correction slide shall be of the type shown in Fig. 1

4. MATERIAL

4.1 All parts with the exception of the thermometer, counter-weight and the top and bottom clamping brackets shall be made from hard brass.

4.2 The thermometer shall be of the liquid-in-glass type with solid stem and shall be made of such material as prescribed in Appendix A.

4.3 The counter-weight shall be of lead, faced on both sides with brass

*Rules for rounding off numerical values (*revised*).

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4.4 The top and bottom clamping brackets shall be made from ordinary brass.

5. DIMENSIONS

5.1 The correction slide shall have the dimensions given in Table 1 and Fig. 1.

TABLE 1 DIMENSIONS OF CORRECTION SLIDE FOR MERCURY BAROMETERS

Sl No.	DETAIL	DIMENSIONS
(1)	(2)	(3)
		mm
i)	Stock	206 × 33 × 10
ii)	Width of index scale	7.5
iii)	Latitude scale	45 × 6.5
iv)	Slide scale	206 × 14
v)	Distance from bottom of stock to 0°C graduation mark	60
vi)	Distance from 0°C graduation mark to zero graduation of index scale	114.6
vii)	Distance from bottom of stock to the lowest graduation on the slide scale	8
viii)	Overall length of the graduated portion on index scale equal to 1 mb	7.43
ix)	Overall length of graduated portion of 'height above water line' scale	26.8
x)	Distance of 1 mb on slide scale	7.43

6. GENERAL REQUIREMENTS

6.1 The stock shall be either machined from a bar or made from a casting.

6.2 A slot for the latitude scale shall be cut in the stock. The slot shall be positioned accurately.

6.3 The scales given in 6.3.1 and 6.3.2 shall be engraved on the face of the stock.

6.3.1 Index Scale — The index scale shall have a range from + 0.5 to - 0.5 mb with a scale value 1 mb = 7.43 mm. It shall be sub-divided to 0.5 and 0.1 mb, the graduations being 3 and 2 mm long respectively



(see Fig. 1). The zero and positive graduations and figures shall be filled black, and the negative graduations and figures are filled red. The maximum position error of any graduation line referred to the zero line shall not exceed ± 0.1 mm.

6.3.2 Temperature Scale — The range for the temperature scale shall be from -10°C to $+50^{\circ}\text{C}$, with a scale value $10^{\circ}\text{C} = 12.7$ mm. Each 10°C graduation line shall be 1.5 mm long with appropriate values engraved on the stock. The symbol $^{\circ}\text{C}$ shall be engraved on the stock below the lowest graduation. The graduations and figures shall be filled black. The maximum error of position of any graduation referred to the 0°C graduation shall be ± 0.1 mm.

6.4 The slide shall carry the scales for 'height above water line' and the 'correction to barometer'. The left edge of the slide shall be bevelled to an angle of 45° so as partly to oversail the thermometer and thus bring the 'correction to barometer' scale close to the mercury thread of the thermometer. To the back of the slide scale shall be attached a rack, actuated by a pinion working in a bearing attached to the stock. The design and assembly of the rack and pinion shall be such that the slide scale can be easily and smoothly moved up or down by rotating the knurled knob.

6.4.1 The 'height above water line' scale shall have a range from 0 to 30 m with a scale value $30 \text{ m} = 26.8$ mm. The zero and each of the 5 m graduation lines shall be 3 mm long, and filled black. The distance of the zero of the height scale from the zero of the 'correction to barometer' scale shall be 114.6 mm. The maximum error of position of any graduation referred to the zero line shall be ± 0.1 mm. The unit symbol 'm' shall be engraved above the scale.

6.4.2 The 'correction to barometer' scale shall have a range from -10 to $+7$ mb with a scale value $10 \text{ mb} = 74.3$ mm. It shall be graduated to 0.5 and 0.1 mb over the whole range, the lines being 3 and 2 mm long respectively. Positive and zero graduations and figures shall be filled black while the negative graduations and figures are filled red. The negative graduations shall be above the zero line and the positive graduations below the zero line. The scale shall be figured at each millibar. Maximum permissible error of any graduation referred to the zero line shall be ± 0.1 mm. The unit symbol 'mb' shall be engraved on the scale at the bottom as shown in Fig. 1.

6.4.3 It shall be ensured that the rack and pinion movement shall move easily and smoothly over the whole length of the rack.

6.5 The thermometer shall meet all the requirements laid down for it in Appendix A.

6.6 The latitude scale plate shall be a good sliding fit in the slot of the stock. When mounted on the stock, it shall be ensured that the face of the

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latitude scale plate is flush with the front face of the stock and that the vertical adjustment shall be possible from 0 to 90° over the full range of the index scale.

6.6.1 The latitude scale shall be graduated along the right hand edge and figured at every 10° from 0 to 90°, intermediate graduations for every 2° shall be inserted from 20° to 70°. The 2° graduations shall be 1 mm long and the tens 2.5 mm long. The positioning of the graduations shall be as given in Table 2.

TABLE 2 POSITIONING OF THE LATITUDE GRADUATION ON THE LATITUDE SCALE PLATE

Above 45° latitude	46	48	50	52	54	56	58	60	62	64	66	68	70	80	90
Below 45° latitude	44	42	40	38	36	34	32	30	28	26	24	22	20	10	0
Distance from 45° latitude mark (mm)	0.6	2.0	3.3	4.7	6.0	7.2	8.4	9.7	10.8	11.8	12.8	13.9	14.7	18.0	19.3

6.6.2 A short red mark shall be engraved on the left hand edge opposite the point corresponding to latitude 45°. The maximum error in position of any graduation mark referred to the 45° point shall be ± 0.1 mm.

6.7 The counter-weight shall be a shaped lead weight faced with brass. The attachment of the brass to the lead shall be secure. The total weight of the counter-weight shall exceed that of the finished slide including all other accessories by 120 ± 20 g. The inner face of the brass shall be lined with fine baize to avoid damage to the barometer case when attached to it.

6.8 The accessories attached to the stock shall consist of a pinion bracket, the thermometer securing plates and top and bottom clamping brackets. The hinges on the clamping brackets shall be sufficiently strong to enable the slide and the counter-weight to be firmly clamped to the barometer and they shall be capable of springing slightly so as to engage barometer cases having outside diameters varying from 24 to 27 mm.

7. TESTS AND ACCURACY

7.1 The thermometer shall have errors not exceeding those prescribed under A-6 in Appendix A.

7.2 The finished slide must satisfy the tests given in 7.2.1 to 7.2.3.

7.2.1 With the index line on the latitude scale adjusted to coincide with the value + 0.5 on the index scale, it shall be possible to rack the slide up until the 30 m mark on the 'height above water line' scale is opposite the 90° graduation mark on the latitude scale.

7.2.2 When the index line on the latitude scale is adjusted to coincide with the value -0.5 mb on the index scale, it shall be possible to rack the slide down until the '0' metre mark on the 'height above water line' scale is opposite the 0° graduation mark on the latitude scale.

7.2.3 When the index line on the latitude scale is in alignment with the zero graduation on the index scale and the zero graduation on the 'height above water line' scale is set opposite the 45° graduation index mark on the latitude scale, the -0.05 mb graduation of the 'correction to barometer' scale shall coincide with the 0°C graduation on the thermometer stem to within ± 0.3 mm.

8. TOLERANCE

8.1 In as much as the instrument is a precision type, the specified dimensional tolerances shall be strictly adhered to so that the final value of the correction to be applied to a barometer as indicated on the slide shall correspond with that calculated with the help of tables within a tolerance of ± 0.1 mb.

9. WORKMANSHIP AND FINISH

9.1 All graduated surfaces shall be silvered dull white. The complete slide with the exception of the counter-weight shall be protected by hard transparent lacquer. Durable red filling shall be used where specified. All other lettering and engraving shall be filled with durable black pigment. The counter-weight shall be finished with durable black enamel.

10. MARKING

10.1 The following markings shall be engraved neatly and legibly on the front face of the stock, besides the unit symbols already mentioned:

- a) The manufacturer's name or registered trade-mark, if any;
- b) The words 'correction to barometer' and 'Index' at appropriate places as shown in Fig. 1; and
- c) The serial number and year of manufacture

10.1.1 The correction slide may also be marked with the ISI certification mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

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11. PACKING

11.1 Each correction slide complete with the counter-weight shall be wrapped in tissue paper and packed in a stout bonded card-board carton with sufficient soft packing material to withstand normal transit risks. Each such card-board carton shall be marked with the name of the instrument namely 'Barometer correction slide' and its serial number on the lid. Alternately, the slide shall be packed as agreed to between the purchaser and the manufacturer.

12. TESTING AND INSPECTION

12.1 Each barometer correction slide shall be tested individually for conformity to all the requirements of this specification.

A P P E N D I X A

(Clauses 4.2, 6.5 and 7.1)

REQUIREMENTS FOR THERMOMETER FOR BAROMETER CORRECTION SLIDE

A-1. TYPE

A-1.1 The thermometer shall be mercury-in-glass, solid stem and graduated for vertical total immersion. The pattern shall be as shown in Fig. 2.

A-2. MATERIAL

A-2.1 Glass Tubing — The capillary and bulb tubing used shall be as prescribed in IS : 4610-1968*

A-2.2 Thermometric Liquid — The recommended thermometric liquid is pure and dry mercury

A-3. DIMENSIONS

A-3.1 The dimensions of the thermometer shall be as specified in Fig. 2.

A-4. REQUIREMENTS

A-4.1 The stem shall be straight and of circular cross-section. Its diameter shall not be less than 6.5 mm and not greater than 7.5 mm as measured by a ring gauge or shadow graph.

*Specification for glass tubes for general purpose and reference thermometers.

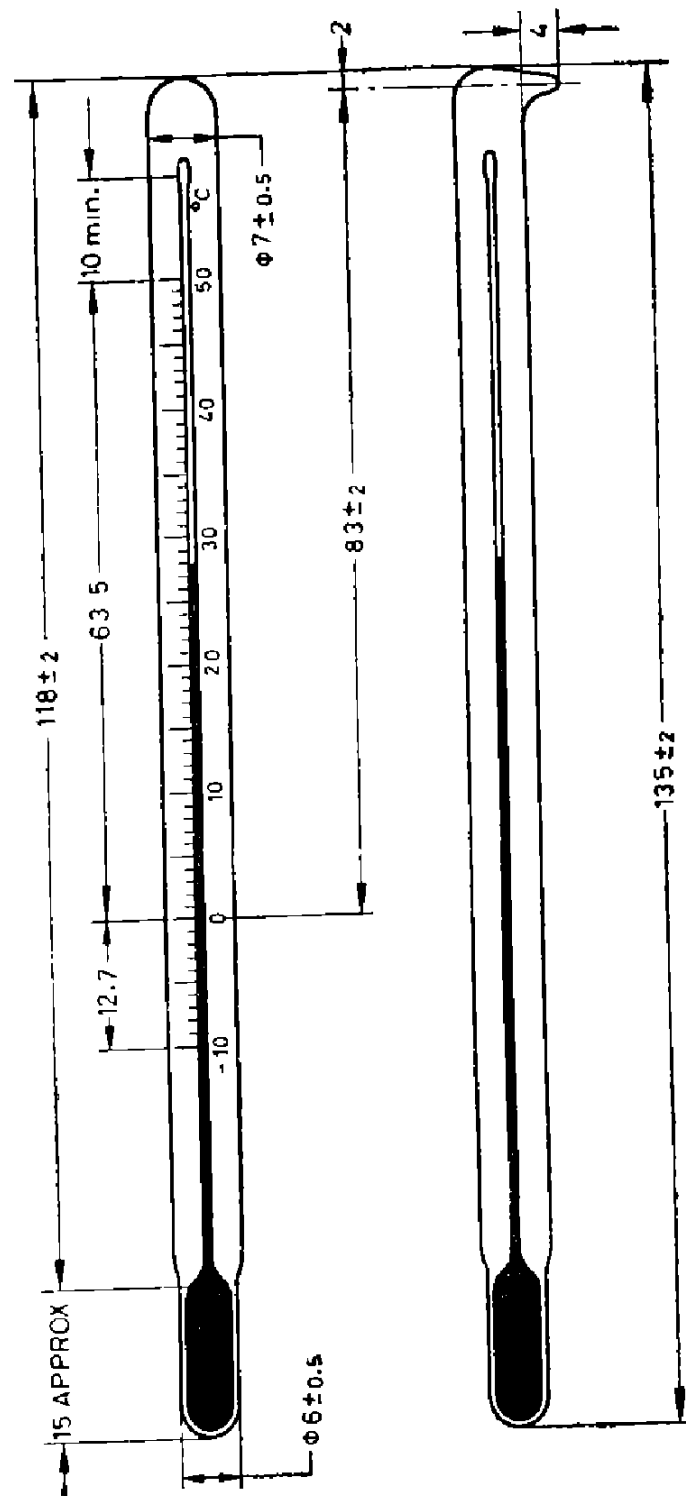


FIG. 2 THERMOMETER FOR BAROMETER CORRECTION SLIDE

All dimensions in millimetres.

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A-4.2 No enlargement in bore shall be present in the graduated portion of the stem or within 5 mm from either end of the scale.

A-4.3 The bulb shall be cylindrical and in alignment with the stem.

A-4.4 The external diameter of the bulb shall be 6 ± 0.5 mm and in no case it shall exceed that of the stem. The shape and finish of the bulb and the expansion chamber shall be such as not to entrap the thermometric liquid.

A-4.5 An elongated and pear shaped expansion chamber with a hemispherical top and without re-entrant shoulders shall be provided at the top end of the capillary in line with the capillary bore to enable the thermometer to withstand a temperature of at least 65°C.

A-4.6 The top of the stem of the thermometer shall have a bent nib extending 4 mm to the back of the thermometer to secure it in place in a hole drilled in the stock of the correction slide.

A-4.7 The thermometer shall be suitably annealed before engraving.

A-5. GRADUATION AND FIGURING

A-5.1 The thermometer shall have a nominal range from -10°C to $+50^{\circ}\text{C}$.

A-5.2 The graduation lines shall be clearly engraved at each degree celsius and shall be of uniform thickness not exceeding 0.15 mm. They shall be filled with permanent black pigment.

A-5.3 The graduation lines shall be at right angles to the axis of the thermometer when the thermometer is viewed from the front in a vertical position. They shall all finish on an imaginary line parallel to the axis on the right hand side.

A-5.4 Every degree graduation line shall be 1.5 mm long and every 5°C line 3 mm long. The 0°C graduation shall be carried right across the front of the thermometer.

A-5.5 The numerals -10 , 0, 10, 20, 30, 40 and 50 shall be etched at the right places on the stem on the right hand side as shown in Fig. 2. The figures shall be parallel to the axis of the thermometer and shall be placed in such a way that they are bisected by an extension of the line to which they refer.

A-6. ACCURACY

A-6.1 The maximum permissible scale error at any point on the scale shall be $\pm 0.2^{\circ}\text{C}$.

A-6.2 The maximum positional error of any graduation mark on the thermometer stem referred to the 0°C graduation line shall be ± 0.5 mm.

A-7. MARKING

A-7.1 Each thermometer shall be marked legibly with the following:

- a) The letter 'C' near the top of the scale;
- b) *Manufacturer's name or trade-mark, if any, at the back of the thermometer; and*
- c) Serial number and year of manufacture.

A-7.2 The thermometer may also be marked with the ISI Certification Mark (*see 10.1.1*).

A-8. PACKING

A-8.1 Each thermometer shall be wrapped in thin tissue paper and packed in a circular card-board carton, approximately 13 mm in diameter. Alternately, they shall be suitably packed as agreed to between the purchaser and the supplier.

A-9. TESTING AND INSPECTION

A-9.1 Each thermometer shall individually comply with all the requirements of this specification. The accuracy tests shall be carried out in accordance with IS : 6274-1971*.

*Method of calibrating liquid-in-glass thermometers

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ON
METEOROLOGICAL INSTRUMENTS**

IS:

4849-1968	Specification for rain measures
5225-1969	Specification for raingauge, non-recording
5235-1969	Specification for raingauge, recording
5793-1970	Specification for aneroid barometers
5798-1970	Specification for mercury barometers
5799-1970	Specification for windvane
5900-1970	Specification for hair hygograph
5901-1970	Specification for thermograph, bimetallic
5912-1970	Specification for anemometer, cup counter
5924-1970	Specification for clock mechanisms and drums for meteorological instruments
5945-1970	Specification for barograph, aneroid
5946-1970	Specification for whirling psychrometer
5947-1970	Specification for charts for recording meteorological instruments
5948-1970	Specification for thermometer screens
5973-1970	Specification for pan evaporimeter
6805-1973	Specification for assmann psychrometer
6806-1975	Specification for snowgauge
6871-1973	Specification for distant indicating wind equipment
7243-1974	Specification for sunshine recorder
7244-1974	Specification for thermometer for mercury barometer
8336-1977	Specification for thermoelectric pyranometer
8693-1978	Specification for net pyroradiometer
8754-1978	Specification for electrical anemograph

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Conversion
Force	newton	N	1 N = 0.101 972 kgf
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J s
Flux	weber	Wb	1 Wb = 1 V s
Flux density	tesla	T	1 T = 1 Wb m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemens	S	1 S = 1 A/V
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²

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 PATNA 800004 5 36 55
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Printed at Delhi Printers, Delhi, India